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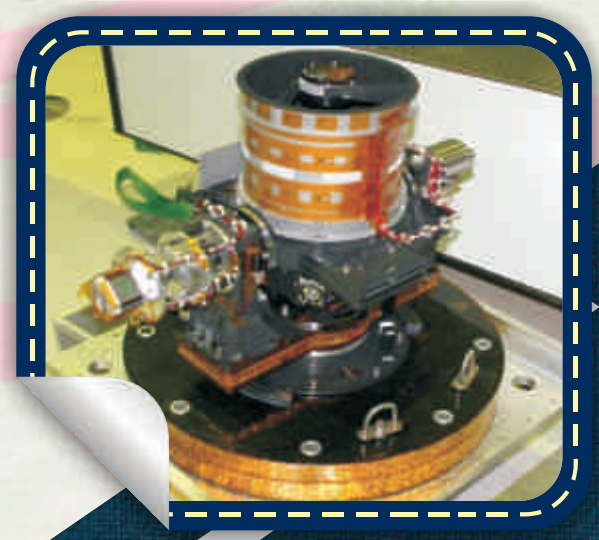

सैक कुरियर
SAC COURIER

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Shri D K Das takes over as Director, SAC

Shri D K Das took over as Director, Space Applications Centre in July 2018. He is a graduate in Electronics Engineering from Indian Institute of Technology (IIT), Banaras Hindu University (BHU) formerly known as IT, BHU.

He joined Space Applications Centre, ISRO in 1983. He started his career in the area of Communication & Navigation Satellite technology and made an outstanding contribution towards Assembly, Integration and Checkout of over 30 payloads for INSAT/GSAT and NavIC series of satellites built at SAC, beginning with INSAT-2A.

He is a recipient of ISRO-ASI award for the year 2010 for his contribution in the area of Spacecraft and related technologies. He is also a recipient of ISRO Merit Award for the year 2010 and ISRO Performance Excellence Award for the year 2015.

He is a member of Space Communications and Navigation Committee (SCAN) of International Astronautical Federation (IAF)

Since 2016, he was the Associate Director of Space Applications Centre (SAC), ISRO.

SAC Courier wishes All the Best in his new assignments

Interview with Shri Vikas Patel, Group Director, Planning & Projects Group (Retd.)

SAC Courier (SC): Sir, please share your initial experience at SAC.

Vikas Patel (VP): I joined SAC as Sci/Eng. "SC" in Technology Transfer and Industrial Interface Cell in 1988 under Shri P Panikar. Prior to that I worked for 5 years in Reliance Industries, Ahmedabad as Electronics Engineer. Having worked with private company, initially I found government set up very motivating. Since this was an opportunity to serve the nation, I took it up. Various domain that I was associated with includes technology transfer, industrial collaborations, project monitoring, managing sponsored research with academia and in-house TDP/ R&D and so on. From 1988 to 2002, I was associated with Technology Transfer and Industrial Interface Cell, after that till 2005 I was with Project Monitoring Group and then from 2008 to 2014, I was given the responsibility of head of RESPOND and Research Coordination Division. Since 2014 till 2018, I served as Group Head and Group Director of Planning and Projects Group. Throughout my journey, I got an opportunity to do activities of varied nature.

SC : You were always enthusiastic about R&D/ TDP/ RESPOND activities. Please tell us about this endeavour.

VP : I was associated with TDP/ R&D/ RESPOND activities for about seven years. During my association, we established a system of evaluating the research projects. Since there was no evaluation mechanism in place, it was very challenging to manage such big number of projects with academia. We established system wherein all completed RESPOND research projects were given weightage based on the identified parameters. With the help of such method we evaluated all RESPOND projects completed till 2008 and came out with evaluation document. Later similar weightage criteria was developed for evaluating TDP/ R&D activities. Based on this later a two layer TDP/ R&D review system was introduced. In order to increase the coverage of Respond sponsored research, state wise interest exploration meetings were also conducted in phased manner throughout the country.

SC : Sir, you have also contributed significantly in the fields of Technology Transfer & Project Monitoring. Can you throw some light on these experience?

VP : My first assignment as Project Manager was a little different than the conventional project management. I was project manager for DLR-SAR flight campaign, which was part of JEP microwave project for utilization of microwave sensors data. I was responsible for overall flight route management which included ground presence of teams for assessing ground truth at the same time across varied identified locations. This project required various clearance from series of ministries including defence. Ensuring proper synchronization between air and ground segment was a challenge in itself. Another unique project management experience was during the establishment of ground station under ASCS project, which was successfully completed before time due to excellent teamwork. Apart from these, I was project manager for Utilization Projects of RISAT, MeghaTropique and SARAL-ALTiKA. Based on learnings from various Utilization Projects, I tried to set up system of Utilization Project for IRNSS-GAGAN and embedded the culture of conducting utilization meets.

SC : You took over the challenging role of GD, PPG in 2017. You always encouraged the enhanced and effective role of PPG in planning and monitoring activities. Please tell about your experience as GD, PPG.

VP : As GD, the scope became wider and broader. The major responsibility of this role includes

implementing the vision of Director – realising the vision, for the benefit of the Centre. Within PPG I was responsible for ensuring an environment for synergizing various divisions which in turn contributes in smooth functioning of the Centre. As GD, I had to undertook Centre level tasks such as recruitment and placement of resources, central level committee formation, maintain appropriate information flow and system streamlining. I was responsible for committee formation, more than 18 Centre level Committees were formed, which eventually enables decision making and further planning. Apart from these, as GD I tried my best to provide nurturing environment for the entire PPG team so that they can come up with their full potential. There are many Centre level unsung activities like conducting activities under Swachh Bharat, Security committee, ISRO level committees etc. which required active and quick decision support. One of the unique activity is tree plantation across all SAC campuses and colonies towards building green campus. Ensuring each employee participation for such drives is one of the important but unsung activity.

SC : How was your experience as Chairman of SAC Courier editorial board?

VP : It was indeed very good experience. SAC courier is public face of SAC, hence generating appropriate content was an interesting task. We have to ensure that latest developments at SAC are duly incorporated in it and is timely released. Through this we can easily ensure inter-Centre information flow.

SC : You have experience of working with young generation to senior management. What message would you like to give to the SAC community?

VP : It is always insightful to work with people of all cadre. I would surely advise young generation that wherever you are and whatever you do, your goal should be for progress of your organization, yourself and nation. One should keep aside personal grievances and ego aside and should always have team spirit.

NOSTALGIA

Former Prime Minister, Late Shri Atal Bihari Vajpayee with ISRO Scientist

GSAT-29 Optical payloads

INTRODUCTION:

Optical Communication Terminal (OCT) is the first optical communication experimental payload of ISRO, indigenously developed at Space Applications Centre, planned to be flown in GSAT-29 mission. The optical communication payload will demonstrate free space communication link in shortwave infrared (SWIR) optical wavelength ($\lambda \approx 1550$nm) between GEO Orbit and Ground station. This particular wavelength range has more Maximum Permissible Exposure (MPE) limits for human eye and more matured technology as it is used in fibre based communication systems at Ground. This demonstration will be useful for future optical communication link systems, which can be used for supporting Human Space Flight Mission, Earth Observation Mission data transmission via data relay satellites, satellite command, & telemetry, data transmission from deep space probes, launch vehicle mission support and communication within satellite clusters. The optical communication link will enable accelerated data transmission in near real time ($\approx$ 1 Gbps) with Bit Error Rate (BER) of 10-9 or better.

BRIEF DESCRIPTION:

An end-to-end optical communication systems design is driven by the desired link characteristics and environmental/channel constraints placed on the transceivers. There are several major design drivers, including tracking and pointing link margin, communication link margin, data rate and bit-error-rate (BER) under the constraints of mass, power and aperture size. A high data rate with less power requires narrow beam-width thus asking for near diffraction limit performance of the optical system. This also puts stringent requirement on pointing accuracy, drift rate, jitter and payload structural stability. Stray light (light scattered into the receivers) is the primary source of problem. Optical filtering schemes have been adopted for rejecting or minimizing background light seen by the receivers. OCT consists of following sub-systems: acquisition, tracking and pointing (ATP) module, laser transmitter & optical receiver (OCM Module), and Optics Sub-system. ATP module is an important component of the communication link. It performs the critical function of collecting optical energy, collimating communication beam, maintaining line-of-sight between the transmitter and receiver stations with sufficient signal strength, irrespective of external disturbances. The telescope used is of Cassegrain type having an afocal configuration as it allows for easier incorporation of fine scanning mirrors, beam splitters, collimating & coupling optics. The whole assembly is mounted on a two axes gimbal, which is capable of steering the optical communication beam over desired area. Gimbal based coarse pointing mechanism is used for acquisition and tracking of optical beam. Afterwards the piezo actuator based fast steering mirrors (FSM) corrects for high frequency platform disturbances & atmospheric turbulences. The complete optical assembly acts as transmitter as well as receiver and a dichroic optical filter has been used to split Tx & Rx wavelengths. Overall, optical schematic has been shown in Fig.2 & Fig.3.

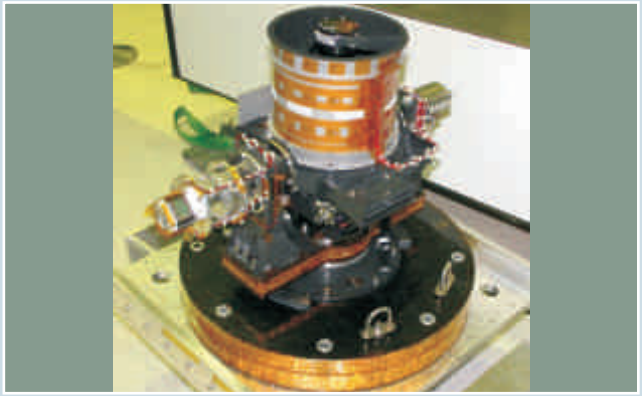


Fig.1 OCT Payload Optical Module Mounted on Payload Fixture

OCM consists of laser transmitter & receiver which uses Distributed Feedback (DFB) Laser Diode as Tx and InGaAs PIN Photodiode as Rx. Laser output power is intensity modulated utilizing On-Off Keying modulation technique. The optical signals are then amplified by 2.5W Erbium doped Fiber amplifier (EDFA) to get the required transmitting power. The amplified optical signals are then passed to 200mm optical telescope of ATP. The optical communication payload shall have three modes of operation in switchable configuration. One is GROUND-GEO-and forward communication, in which data can be stored on-board in SSR-R and can be transmitted later to ground. Ground-based OCT terminal would scan for the space-based terminal. Upon successful acquisition, both the terminals shall maintain line-of-sight and ensure sufficient signal strength for communication.

The coverage area for establishment of optical communication link is defined as Indian mainland. The footprint at optical frequency is very small (~2 Km). Hence, gimbal based optical antenna

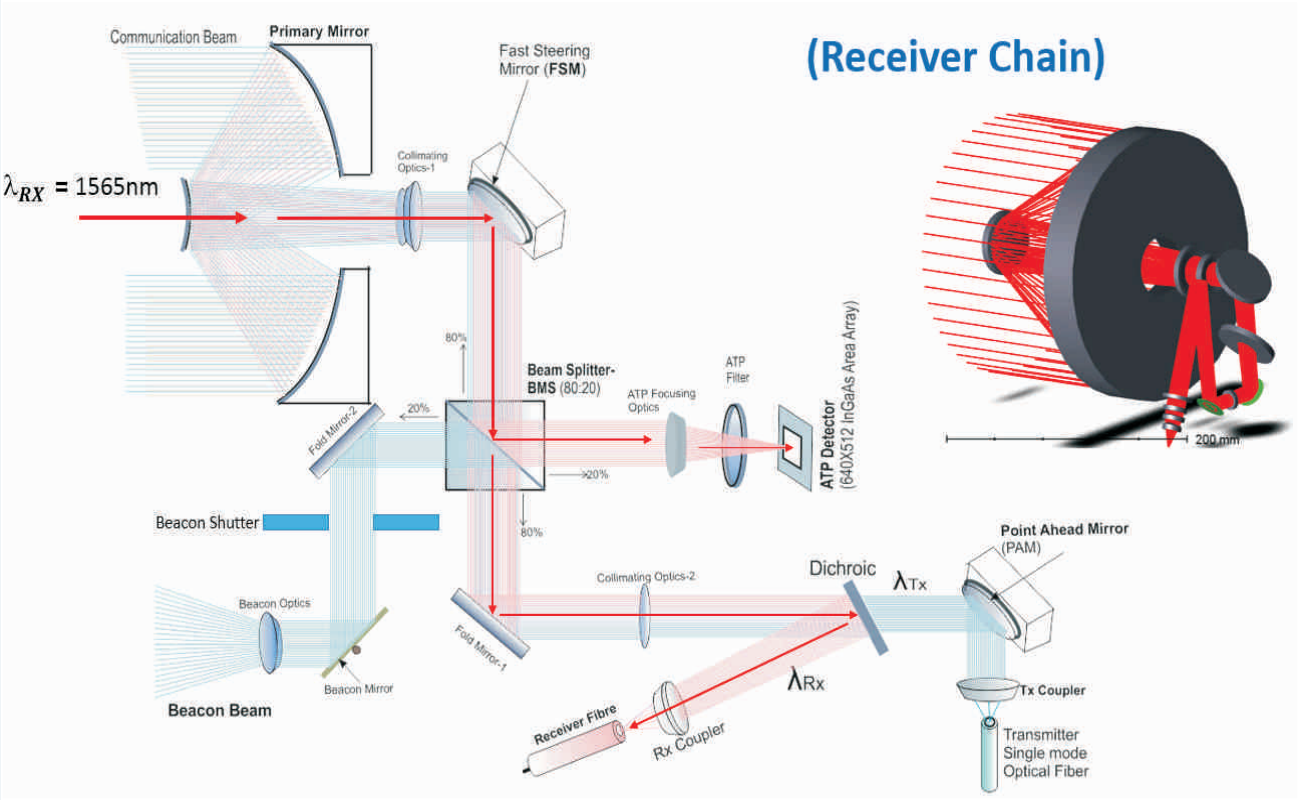


Fig.2 (OCT Receiver Chain)

GROUND loopback communication mode in which it can support duplex communication at data rate up to 1 Gbps. Second mode of operation is transmission of Geo-High-Resolution-camera (GHRC) data, another experimental high-resolution optical camera payload of GSAT-29, where data rate can vary between 168 Mbps to 1 Gbps. The third mode of operation is optical store (telescope) is being used for steering optical beam over entire coverage area. The gimballed telescope can be steered up to ±30° in azimuth and ±30° in elevation. This provides full Indian mainland coverage as shown in Fig.4.

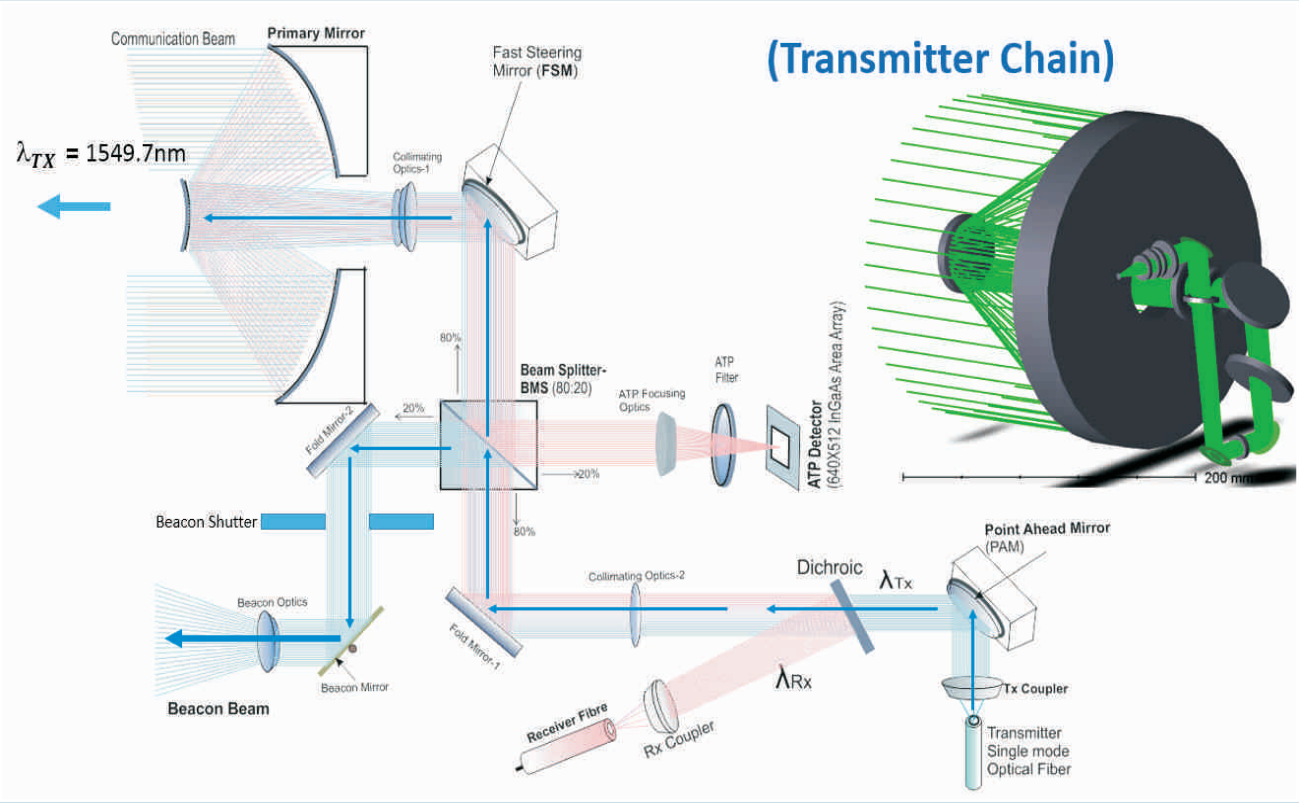


Fig.3 (OCT Transmitter Chain)

NEW TECHNOLOGIES:

Several new technologies have been adopted first time for development of optical communication payload. Development of 3D printed aluminium telescope cylinder, indigenous development of aluminium based telescope metal mirror, development of optical fiber alignment mechanism, indigenous development of piezo based fast steering mirror platform, use of electro-mechanical shutter for beacon beam control, development of stepper motor based gimbal mechanism, implementation of FPGA based acquisition-tracking & pointing algorithm for on-board closed loop control electronics, indigenous development of piezo drive electronics etc. are among them.

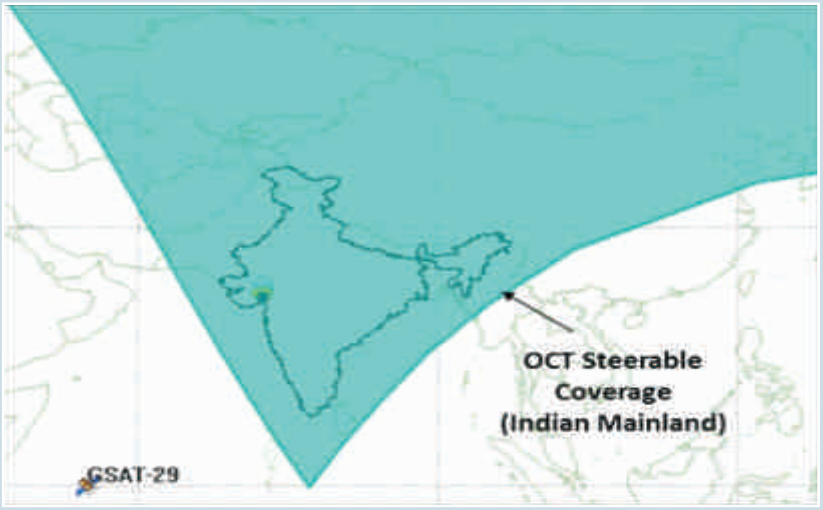


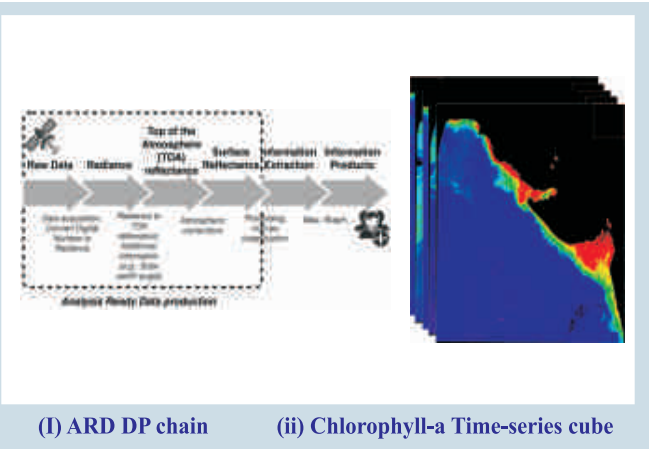
Fig.4 (OCT Coverage Region)

Courtesy Inputs from:
Abhijit Chatterjee

Multi-temporal Datacube of OCM Geophysical Parameters

Introduction

Extraction and formulation of spatio-temporal relationship has always been the very core of resource planning and management. Remotely sensed Earth Observation (EO) data is the prominent input for deriving such relations due to the multi-temporal nature of satellite data. OCM-2, launched by ISRO in Sep. 2009, since then



(I) ARD DP chain (ii) Chlorophyll-a Time-series cube

OCM-2 is providing continuation of ocean data services to OCM-1 users. The available long term archive(LTA) of OCEANSAT data can help to study long term changes of ocean parameters. Multi-temporal data generated from Ocean Colour Monitor (OCM) sensor will deliver a large amount of information in the context of temporal behavior of geophysical components.

The multi-temporal Datacube of Geophysical parameters derived from available LTA of OCM-2 data reduces the complexity by eliminating the need of advanced processing systems at user-level, thereby providing ARD (Analysis-Ready Data). The TDP on "Time-series of OCM-2 Geophysical data" contributed in generating algorithms and platform for rapid time-series data access and pre-processing to generate the afore-mentioned ARD.

What is a EO Datacube?

A EO datacube can be desctibed as a massive multi-dimensional array of 'raster' or 'gridded' data whose size is significantly beyond the main memory resources of server hardware. The Data values, all of same data type, sit at a regular grid points as defined by n-axes of n-dimensional cube. Coordinates along these axes allow addressing data values unambiguously.

Computing Performance

The available OCM-2 data had total cumulative size of more than 30 TeraBytes (TB) and as such high computing performance became one the major requirement of generating the datacube structure. This was achieved by developing efficient Python and C++ codes for geophysical parameter generation, multi-temporal image registration, indexing and ingestion; to efficiently utilize multi-processing environment. Both data and task-level parallelism techniques were employed to process data within a meaningful time duration.

Major challenges and milestones achieved

The entire activity was divided into smaller goals for building this huge Datacube: development of scripts for large data handling and reducing redundancy; efficient storage and categorization of radiance, reflectance and geophysical data for rapid access; reference generation and multi-temporal image registration; and finally development of geo-spatial web user interface.

Improved SIFT-based data product registration

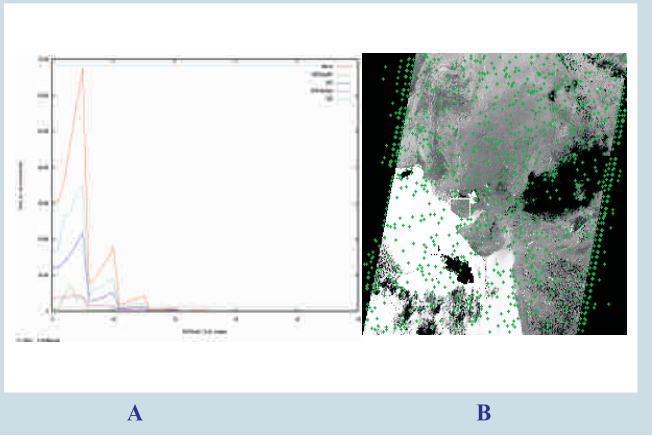
Achieving sub-pixel accuracy is a must for valid time-series data and composite data product generation. An improved Scale Invariant Feature

Transformation technique was developed to solve this challenge. For all the years 2010-2017, seasonal references are generated and geometrically registered for within the year image registration. Further to handle huge amount of associated data processing, extensively parallel c++ software were written for the utilizing full potential of multi-processor environment using openmp, SSE, and AVX. Figure (a) shows the results of TAT (turn-around-time) for various sized image, before (red) and after (green) optimization. Figure (b) shows extracted features and Figure (c) and (d) show differences in composite before and after registration.

Multi-temporal data analysis portal to generate cloud-free custom mosaics on-the-fly, generate time-series statistics and much more.

Linkage

The development of Multi-temporal Datacube of OCM Geophysical Parameters is based on OCM-2 data and it will be linked with the future OCEANSAT-3/3A mission.



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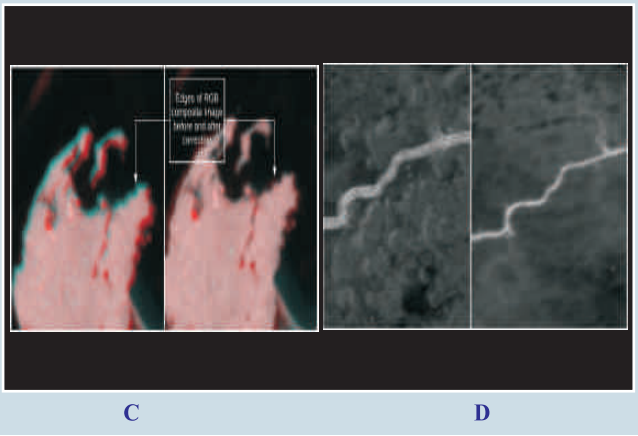

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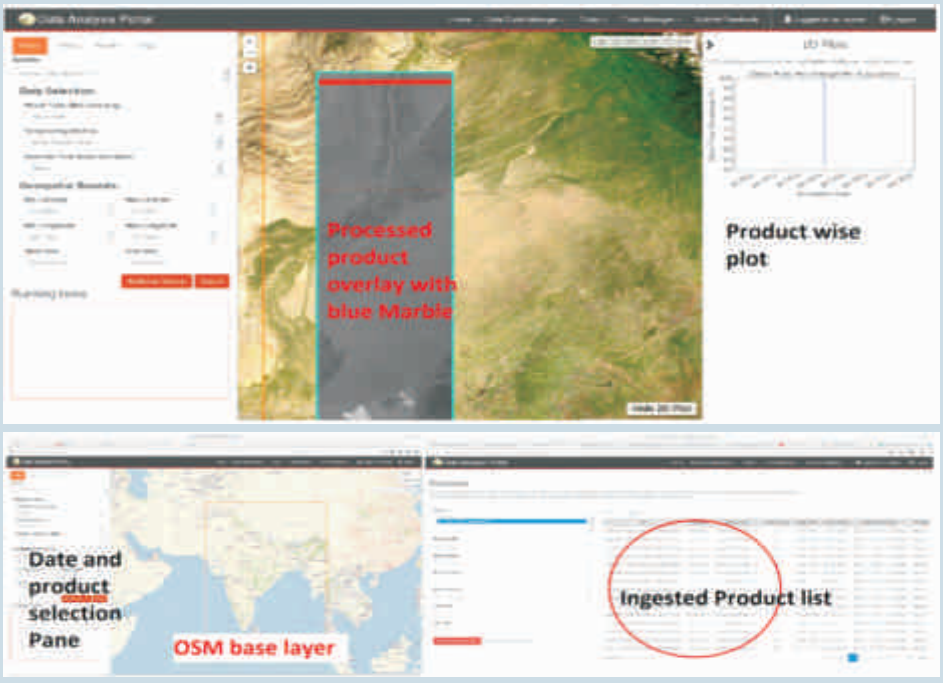

Courtesy Inputs from:
Tushar Shukla, Nitesh Kaushik, Sampa Roy and Debajyoti Dhar

A Glimpse into SAC LTCC Foundry

SAC has established India's first space qualified Low Temperature Co-fired Ceramic (LTCC) foundry, with W-band circuit fabrication capability. The foundry is located at Building 23 in the main SAC campus. LTCC is today recognized globally as the technology of choice for the miniaturization of high frequency electronics packaging. It is a multi-chip-module (MCM) technology that is used to create three dimensional circuits, bringing together passive components and bare semi-conductor components into one high density and highly versatile electronics module. The low firing temperature (~ 850 °C) enables the use of highly conductive metals like Gold and Silver, which translates into low conductor losses at high frequencies. With the inherent hermetic properties that this technology offers, it is the natural choice for reducing weight and size of high reliability space hardware.

Fig.1 SAC LTCC Foundry

Introduction to LTCC Material Systems

LTCC material system consists of bare glass-ceramic sheets (also called tapes) and compatible Gold or Silver based thick film conductive pastes. The LTCC tapes are prepared by tape casting of a mixture glass-ceramic and organic binder slurry on a polymeric carrier. The tapes are then cut into standard sizes (ex. 6.5" X 6.5" and 8" X 8") for processing. The composition of pastes is governed by their intended use, viz. for planar interconnection and patterns, for vertical interconnections, for soldering of SMD components, for wire bonding and for attachment of metallic parts such as carrier plates and seal rings.

Ferro, DuPont and Heraus are among the most popular suppliers of different LTCC material systems. The SAC LTCC production line is qualified using the all Gold A6ME LTCC system supplied by Ferro. This choice is dictated by severable outstanding properties such as suitability of use up to 110 GHz, stable dielectric constant and low dielectric loss tangent.

LTCC technology flow

Manufacturing of LTCC multilayer modules is a multi-step process. The first step in this process consists of formation of vias and cavities on each LTCC tape through a mechanical punching machine. The vias are then filled with suitable conductive paste using stainless steel (laser cut) stencil in a thick film screen printer. The conductive patterns are then printed on each layer using stainless steel mesh backed emulsion screens, again in a thick film screen printer. Different printed and via-filled tapes are then collated in an automatic stacking machine that uses visual alignment. The stacked panel is then iso-statically laminated under high pressure (~ 3000 psi) and moderate temperature (70 °C). Individual modules are then singulated from the laminated panel using a hot knife. The singulated modules are then co-fired in a box furnace, in accordance with a prescribed thermal profile that achieves burnout of organic binders (~ 450 °C) and sintering of the multilayer glass-ceramic structure (~ 850 °C). The

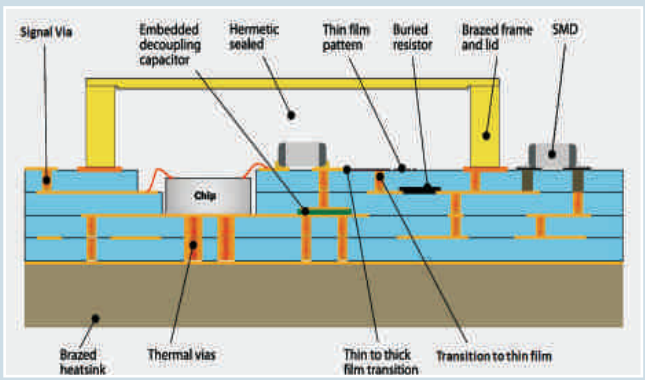

Fig. 2 Typical Features of LTCC

fired multi-layer module is finally diced to exact size using a high speed dicing machine.

At present, SAC LTCC line is capable of processing 6.5" X 6.5" size LTCC tapes. The line is being upgraded to 8" X 8" capacity, the infrastructure establishment and process qualification for which shall be completed by the first quarter of 2019. Fine line features, down to 100 micron in width, can currently be realized using screen printing process. To realize finer line features, the process of thin film deposition and patterning on the top surface

Fig. 3 LTCC technology flow

of fired LTCC modules, is currently under development. The technology flow and corresponding infrastructure available at SAC is illustrated in the flowing graph below.

Design enablement

A comprehensive suite of SAC LTCC foundry design rules, conforming to foundry capability is made available to the designers, before they embark on their designs. The design rule document is available for download, on Vedansh. The design data, once completed, are subjected to automatic design rule checks (DRC), which check for any non-conformity. The DRC deck is presently available in Advanced Design System (ADS) software from Keysight Technologies.

SAC LTCC foundry is also on its way to becoming the first in the world to offer a comprehensive RF Process Design Kit (PDK) that shall contain scalable schematic models for Inductors, Capacitors, Resistors, Planar and Vertical interconnects and parameterized cells (P-cells) in layout. The PDK shall be available for use in Keysight ADS and NI AWR MWO software. The first version of the PDK is due for release in the third quarter of 2018.

Use of SAC LTCC technology

LTCC technology offered by SAC foundry is being widely used for miniaturization and for improving the performance of RF/Microwave subsystems for various satellite payloads. The modules currently under fabrication are C-band TR module for RISAT-1A, S-band TR module for NISAR, S-band Down-Converter Module for NISAR, X-band TRM for RISAT-2A, X-band Feeder SSPA module for RISAT-2A, Ku beacon control circuit for GSAT series of satellites and Driver Amplifier module for IRNSS.

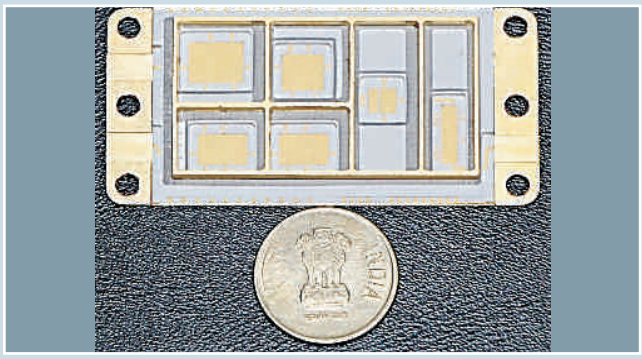

Fig.4 C-band TRM, RISAT-1A

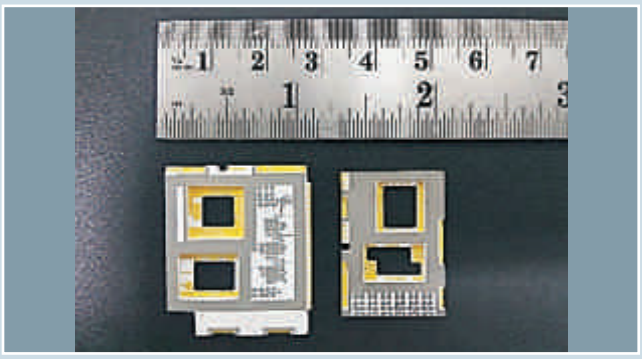

Fig.5 X-band TRM, RISAT-2A

Courtesy Inputs from:
SAC LTCC team

Study of Atmospheric Fronts using RISAT-1 SAR

India's first Synthetic Aperture Radar (SAR), RISAT-1 provides us an opportunity to study the Marine Atmospheric Boundary Layer (MABL) features like atmospheric fronts, rolls, convective & rain cells etc. by detecting the changes in the sea surface roughness which modulates the normalized radar cross-section (NRCS) of the sea surface. One of the most important MABL feature is the atmospheric front, which is the boundary between two air masses. Recent studies show, atmospheric fronts are driving force behind the meteo-tsunamis. They are also often associated with a large proportion of global rainfall, especially with extreme rain events, and can cause damaging flood events. It is therefore very important to identify such fronts. Remote sensing observations, especially those with SAR offer a unique opportunity to detect and study the atmospheric fronts.

Data and Method

RISAT-1 is India's first SAR mission, was launched on April 26, 2012 on-board PSLVXL C19, carrying a C –band (5.35 GHz) synthetic aperture radar in a Sun-synchronous dawn-dusk orbit of altitude 536 km with the inclination of 97.55° and the orbital period of 95.5 min. In the present study, RISAT-1 SAR images at HH-polarization in Medium Resolution SCANSAR (MRS) mode is used. As a pre-processing step, noise filtering is carried out using 5×5 Gamma Map filter and images are downscaled to 1 km to reduce further noises and artefacts. Further, DN (Digital Number) values are then converted to NRCS by performing radiometric calibration.

To understand the characteristics of phenomena, we have converted the NRCS measurements to the sea surface wind field using the existing geophysical model functions (GMFs, CMOD5.N) and validated the retrieved wind field against ASCAT and buoy observations. The SAR signature of a front most often appears as a sharp gradient in SAR intensity. Typical frontal features was captured in SAR images acquired by the RISAT-1 satellite over the Bay of Bengal on May 25, 2014. Here, ERA-Interim reanalysis data is used to compute Thermal Front Parameter, and front points (Blue Pointer) derived from them are overlaid on the SAR imagery (Fig. 2) depicting as an atmospheric front. First, the thermal front parameter is computed, defined by [7] Further, we have also computed LTS (the difference between potential temperature at 700 hPa and 1000 hPa, (Fig. 1) and examined the sea surface temperature gradients using ECMWF ERA-Interim 12.5 km SST data. Frontal points are identified where the gradient of the thermal front parameter is zero. Vertical wind shear from WRF output have been also analysed in order to study the detected atmospheric fronts.

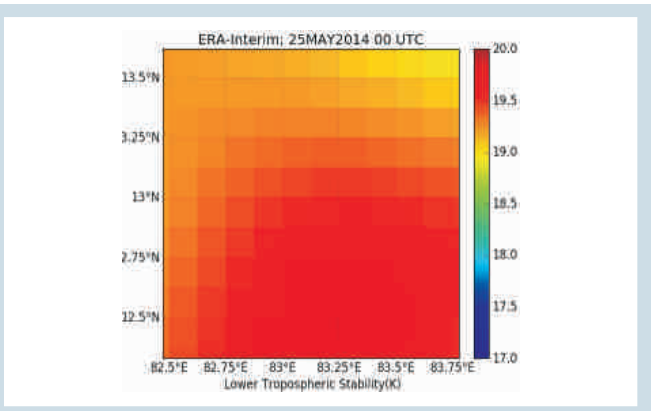

Figure . Lower Tropospheric Stability (K)

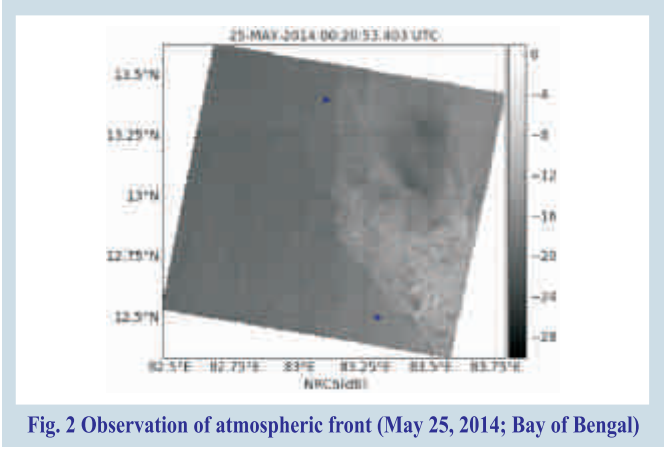

Fig. 2 Observation of atmospheric front (May 25, 2014; Bay of Bengal)

Data Analysis

In order to verify that a frontal feature visible on a radar image of the sea surface is the sea surface manifestation of an atmospheric front, supporting

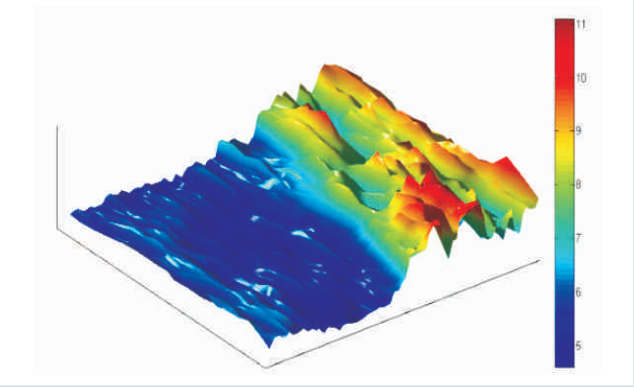

Fig. 3 A change of ~ 4 m/s in wind speed across the boundary separating the fronts

meteorological data as provided by meteorological maps, sea surface wind speed maps, cloud images obtained by optical sensor satellites and sea surface temperature data. The presence of clouds captured by MODIS-TERRA at 04:45 UTC re-iterates our hypothesis of atmospheric phenomena supported further by the homogeneity in the SST and LTS maps across the frontal boundaries. Figure 3 shows the variation of wind speed along the SAR imagery. A significant change in wind speed (~ 3 m/s) was observed across the boundary.

A histogram analysis, as depicted in Fig 4, shows a bi-modal distribution, with mean of one region close to 4 m/s while the other part has mean of 7 m/s. The transition zone is supposedly wider with transition peak at 6 m/s.

The phenomenon is also validated by the thermal front points (Blue pointers) overlaid on SAR imagery, depicting as an atmospheric front. The

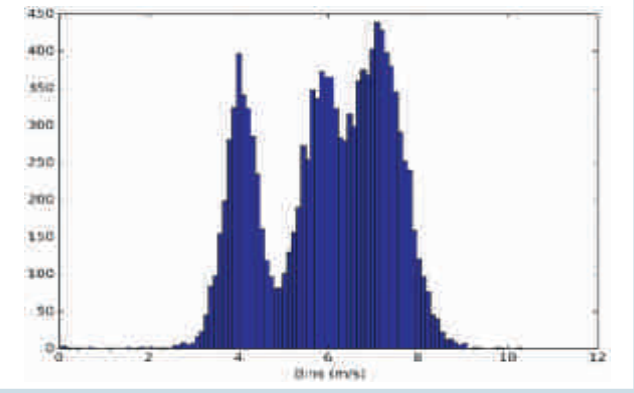

Fig.4 Histogram of the image with bins 100.

vertical wind shear (Fig. 5) is in the range 5 -15 m/s, which is not strong enough to generate severe storm or thunderstorm, and hence the front detected is atmospheric circulation induced atmospheric front. The sign of the values of V950 . ∇ T950 was observed as positive and hence, separated as cold front.

For this study a multitude of SAR, images were analysed for detecting potential front structure. The SAR NRCS data was first used to retrieve wind speed fields, whose analysis exhibit a sharp demarcation at the frontal boundaries, with the wind speed difference around 4 m/s. Ancillary

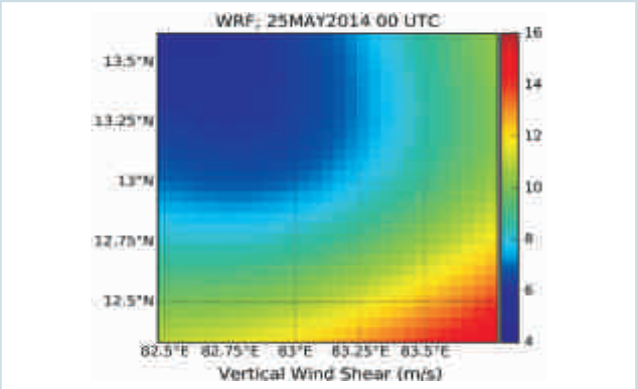

Fig. 5 Vertical wind shear of WRF (Weather Forecasting Research) output at 5 km.

model reanalysis data was used to calculate thermal front parameter for pointing at front locations. In order to separate, it into cold and warm front, and possible frontogenesis mechanisms, different variables and metrics were considered. These mainly include SST, LTS vertical wind shear, $V_{950} . \nabla T_{950}$ etc.

Courtesy Inputs from:
Jagdish, Bipasha Paul Shukla, Abhisek Chakraborty and Raj Kumar

जीसैट-१९ सेटेलाइट नेटवर्क से लेह-लद्दाख में इंटरनेट सुविधा

प्रस्तावना :

जीसैट-१९ (जीएसएटी-१९) एक भारतीय संचार उपग्रह है जिसका भारतीय अंतरिक्ष अनुसंधान संगठन ने भूस्थिर उपग्रह प्रक्षेपण यान संस्करण ३डी । यान द्वारा ५ जून १७:२८ बजे प्रक्षेपण किया । पारंपरिक ट्रांसपोंडर के बजाय, जीसैट-१९ में भारत के पिछले संचार उपग्रहों की तुलना में बहुत अधिक डेटा थ्रूपूट प्रदान करने के लिए चार-चार केए/केयु बैंड अग्रेषण लिंक बिम्ब में और चार केयु/कए बैंड रिटर्न लिंक बिम्ब में हैं । जीसैट-१९ संचार उपग्रह मल्टी-स्पॉट बीम एंटीना कवरेज के साथ भारतीय मुख्य भूमि के चयनित क्षेत्रों उपयोगकर्ता समुदाय की तेज गति की इंटरनेट सेवा आवश्यकताओं को पूर्ण करेगा । आमतौर पर आपदा की स्थिति में स्थलीय इंटरनेट सेवाएँ ठप हो जाती के जरिए ऐसे समय में भी तेज गति की इंटरनेट सेवा दी जा सकेगी । इसके जरिए सेना शिविर, रिफ्यूजी कैंप अथवा जरूरत के अन्य स्थानों पर भी इंटरनेट की सेवा मुहैया कराई जा सकेगी । सेटेलाइट नेटवर्क के जरिए ऐसे समय में भी गति की इंटरनेट सेवा दी जा सकेगी ।

लेह-लद्दाख के सेना शिविर में स्थलीय इंटरनेट सेवाएँ ठप होने पर भी इंटरनेट कनेक्टिविटी की आवश्यकता को पूरा करने के लिए जीसैट-१९ के माध्यम से लेह-लद्दाख, दो क्यू-बैंड १.२ मीटर उपयोगकर्ता टर्मिनलों को ए.ई.एस./एस.एन.जी.जी./एस.ए.सी. टीम द्वारा फरवरी, २०१८ में सफलतापूर्वक स्थापित और कार्यान्वित किया गया ।

नेटवर्क संरचना :

जीसैट-१९ उपग्रह द्वारा लेह-लद्दाख इन्टरनेट उपलब्धकराने वाली नेटवर्क प्रणाली आरेख चित्र-१ में दिखाई गई है । इसमें इंटरनेट कनेक्टिविटी के लिये जीसैट-१९ का केए डू केयु / केयु डू केए के लिंक एईएस/एसएनजीजी/एसएसी में मौजूद सीमित क्षमता हार्डवेयर के साथ स्थापित किया गया है । इस नेटवर्क प्रणाली में निम्नलिखित समाविष्ट हैं :

- अग्रेषण लिंक के लिये ०.७५ मीटर केए बैंड के दो एंटीना बेस-बैंड के साथ अहमदाबाद भूकेंद्र (ए.ई.एस.) अंतरिक्ष उपयोग केंद्र अहमदाबाद में स्थापित हैं ।
- जीसैट-१९ उपग्रह
- रिटर्न लिंक के लिये १.२ मीटर केयु बैंड उपयोगकर्ता टर्मिनलों

आरेख चित्र - १ लेह लदाख इन्टरनेट उपलब्धकरानेवाली प्रणाली

को लेह-लद्दाख के सेना शिविर में स्थापित किया हैं ।

तालिका - १ में नेटवर्क प्रणाली के अग्रेषण लिंक, रिटर्न लिंक, भूकेन्द्र टर्मिनल और उपयोगकर्ता टर्मिनल के विनिर्देश नीचे दिए गए हैं ।

उपसंहार :

भारतीय अंतिरक्ष अनुसंधान संगठन (इसरो) का अंतरिक्ष उपयोग केंद्र अहमदाबाद हाई थ्रुपुट सैटेलाइट निर्माण और इनके विभिन्न संचार अनुप्रयोग के कार्य में कार्यरत है । भविष्य में हाई थ्रुपुट सैटेलाइट जीसैट-१९, जीसैट-११ और जीसैट-२० एक साथ संचालन में आते ही हाई-क्वॉलिटी इंटरनेट कनेक्टिवटी सस्ती होगी, टेलिकोम और वीडियो सर्विसेज पूरे देश तक पहुंचने लगेगी ।

तालिका - १

क्रमांक	पैरामीटर	विनिर्देश
१.	अग्रेषण लिंक	केएxकेयु
२.	रिटर्न लिंक	केयुxकेए
३.	भूकेंद्र टर्मिनल	0.75 मीटर केए बैंड एंटीना
४.	उपयोगकर्ता टर्मिनल	1.2 मीटर केयु बैंड एंटीना
५.	डेटा दर	2 एमबीपीएस

लेखक : सोमेन्द्र प्रताप सिंह,
अहमदाबाद भूकेंद्र (ए. ई. एस.) अंतरिक्ष केंद्र अहमदाबाद

Payloads delivered

Flag off of Ku & Ka band payloads of GSAT-29 on April 9, 2018.

Flag off of Q/V band payload of GSAT-29 on May 9, 2018.

Flag off of GHRC & OCT payloads of GSAT-29 on July 19, 2018.

Flag off of IIRS payload of Chandrayaan-2 on April 9, 2018.

Flag off of GSAT-7A payload on August 13, 2018.

Flag off of Lander Imager (4 nos) camera of Chandrayaan-2 on September 7, 2018.

Flag off of Hyper Spectral Imaging Satellite (HySIS) on September 28, 2018.

हिंदी माह २०१८ की रिपोर्ट

अंतरिक्ष उपयोग केंद्र में सितंबर २०१८ के दौरान सैक एवं डेकू के स्टाफ सदस्यों के लिए हिंदी माह का आयोजन बड़े हर्षोल्लास के साथ किया गया । उद्घाटन समारोह की अध्यक्षता निदेशक-सैक, श्री दीपक कुमार दास ने की । निदेशक महोदय ने अपने वक्तव्य में पुनः इस बात पर बल दिया की सभी तकनीकी प्रस्तुतीकरणों की प्रथम तथा अंतिम स्लाइड हिंदी में ही तैयार की जाए । इस अवसर पर श्री पीयूष वर्मा, नियंत्रक-सैक तथा श्रीमती नीलू सेठ, वरिष्ठ हिंदी अधिकारी-सैक भी मंच पर उपस्थित रहीं । पिछले वर्षो की भांति इस वर्ष भी उद्घाटन समारोह में सांस्कृतिक कार्यक्रम आयोजित किया गया, जिसका प्रारंभ ईश्वर वंदना और दीप प्रज्जवलन से किया गया । इसके अतिरिक्त ''ब्रेकिंग न्यूज़'' नामक नाटिका द्वारा ट्रैफिक नियमों के पालन के महत्व को समझाया गया । साथ ही गीत-संगीत भी प्रस्तुत किए गए । इस रंगारंग सांस्कृतिक कार्यक्रम के साथ हिंदी माह की शुरूआत की गई, जिसे काफी अच्छा प्रतिभाव प्राप्त हुआ ।

सैक पुस्तकालय द्वारा संपूर्ण हिंदी माह के दौरान हिंदी पुस्तक प्रर्दशनी का आयोजन किया गया । पूरे माह पुस्तकालय में पिछले वर्ष के दौरान खरीदी गई पुस्तकों को प्रदर्शन हेतु रखा गया ।

इस वर्ष सैक ने और एक नई पहल करते हुए सभी प्रतियोगिताओं को 'क', 'ख' और 'ग' क्षेत्र भाषावर्ग के कर्मचारियों के लिए अलग-अलग आयोजित किया । वाहन चालक और कुक, गार्डनर आदि स्टाफ सदस्यों के लिए सरल लेखन प्रतियोगीता आयोजित की गई । हिंदी माह के दौरान कर्मचारियों के परिवार के सदस्यों के लिए भी ६ प्रतियोगिताएँ आयोजित की गई । कर्मचारियों के विवाहतियों के लिए वर्ग पहेली प्रतियोगिता ('क', 'ख' और 'ग' क्षेत्र भाषावर्ग के प्रतिभागियों के लिए अलग-अलग) तथा आश्रित बच्चों के लिए पोस्टर कलर, सुलेखन, श्रुतलेखन, आशुभाषण और वाद-विवाद प्रतियोगिताओं का आयोजन किया गया ।

हिंदी माह के दौरान आयोजित विविधप्रतियोगिताओं में सैक/डेकू के १२५० से भी अधिक स्टाफ सदस्यों ने भाग लिया । संपूर्ण माह के दौरान स्टाफ सदस्यों के लिए हिंदी में अधिकाधिक कार्य करने हेतु प्रोत्साहन योजना भी लागू की गई । देखा गया कि वैज्ञानिकों द्वारा कई तकनीकी प्रस्तुतीकरण हिंदी में दिए गए ।

दिनांक २८ सितंबर २०१८ को हिंदी माह पुरस्कार / प्रमाणपत्र वितरण कार्यक्रम आयोजित किया गया । हिंदी माह के विजेता प्रतिभागियों को श्री डी.आर.पटेल, नियंत्रक-सैक द्वारा प्रमाणपत्र प्रदान कर उनका उत्साहवर्धन किया गया । हिंदी माह के दौरान स्टाफ सदस्यों के बीच यह संदेश पहुँचाने का प्रयास किया गया कि वे सरल हिंदी का प्रयोग करते हुए दैनंदिन कार्य हिंदी में करने में गौरव का अनुभव करें ।

उद्घाटन कार्यक्रम के दौरान मंच पर उपस्थित श्री दीपक कुमार दास, निदेशक-सैक, श्री पीयूष वर्मा, नियंत्रक-सैक एवं श्रीमती नीलू सेठ, वरिष्ठ हिंदी अधिकारी ।

सांस्कृतिक कार्यक्रम के दौरान सैक के कर्मचारियों द्वारा भांगडा की मनमोहक प्रस्तुति ।

डो. सुनीता यादव, उप निदेशक (कार्यान्वयन), क्षेत्रीय कार्यान्वयन कार्यालय, नवी मुंबई के कर-कमलों से निदेशक-सैक की ओर से श्री पीयूष वर्माभद्रूसे, सह अध्यक्ष, राभाकास/नियंत्रक, सैक ने पुरस्कार स्वरूप शील्ड एवं प्रमाण-पत्र ग्रहण किया । श्रीमती नीलू सेठ, वरिष्ठ हिंदी अधिकारी/सचिव, राभाकास,, सैक को भी राजभाषा के प्रभावी कार्यान्वयन के लिए सराहना स्वरूप शील्ड एवं प्रशस्ति-पत्र प्रदान कर सम्मानित किया गया ।

अंतरिक्ष उपयोग केंद्र को अहमदाबाद नगर में केंद्रीय सरकार के कार्यालयों (१०० से अधिक कर्मचारी संख्या) की श्रेणी में वर्ष २०१७-१८ के दौरान उत्कृष्ट राजभाषा कार्यान्वयन के लिए नगर राजभाषा कार्यान्वयन समिति, अहमदाबाद की ओर से १६ अगस्त, २०१८ को राष्ट्रीय डिजाइन संस्थान (एनआईडी), पालडी के सभागृह में संपन्न अहमदाबाद नराकास की ७२वीं बैठक में प्रथम पुरस्कार से सम्मानित किया गया ।

Know your Rules - Government e Marketplace (GEM)

Directorate General of Supplies & Disposal [DGS&D] has created a one stop Government e Marketplace [GeM] to facilitate on-line procurement of common use Goods and Services by various Government Departments/ Organisations / PSUs. Besides enhancing transparency, efficiency & speed in public procurement it provides the tools of e-bidding and reverse e-auction to facilitate Government users to achieve best value for money. In terms of Rule 149 of General Financial Rules 2017 [GFR 2017], procurement of Goods and Services by Ministries and or Departments will be mandatory for Goods or Services available on GeM.

Space Applications Centre has registered with GeM and procurement of goods and services available on GeM has to be carried out through GeM. All procurements made on GeM shall follow the approval powers as prescribed by DOS Purchase Manual 2015 and any amendments thereof. General terms and conditions of Purchase of Goods and Services are available on GeM portal at https://gem.gov.in.

The indent shall be raised in COINS. In order to distinguish GeM indents from other indents in COINS the prefix “GeM” shall be added to Description.

After following the prescribed procedure in GeM and approval of the competent authority, Purchase Orders are released on GeM portal. Subsequently, Purchase Orders are also released in COINS for the purpose of receipt, acceptance and payment.

OBITUARY

SAC Courier deeply mourns the sad demise of our colleague

Shri G S Vaghela
MESA-MSFG-PMF

Visit of Dr. K Sivan, Chairman, ISRO/Secretary, DOS at SAC on August 17, 2018.

Visit of Shri A S Kiran Kumar, Vikram Sarabhai Professor, ISRO/Member, Space Commission and Former Chairman, ISRO/Secretary, DOS at SAC on August 27, 2018.

SAC celebrated Independence Day on August 15, 2018. Shri D K Das, Director, SAC unfurled the National Flag.

National Technology Day celebrations at VSSE

National Technology Day was celebrated at VSSE on May 16, 2018. The theme of the day was ''Science & Technology for Sustainable Future''. During the day, several events were organized and a total of 987 persons visited the Exhibition. The visitors showed great interest and enthusiastically interacted during open house sessions with senior Scientists of ISRO. A Lecture was also arranged by Dr. Anil Gupta Professor, DAIICT, on the topic ''Disruptive Technologies: Tighten Your Seatbelt''.

Technology Transfer, Industry & Academic Interface

During the period Total 4 MoUs and 2 Technology Transfer Agreement were signed.

1. MOSDAC data sharing (Solar Insolation data) agreement was signed with M/s. TerraForm Global, Chennai on April 3, 2018.

2. Technology Transfer Agreement signed with M/s. Kerala State Electronics Development Corporation Limited, Trivandrum for Distress Alert Transmitter on April 19, 2018.

3. Technology Transfer Agreement signed with M/s. Alpha Design Technology Pvt. Ltd., Bengaluru for Distress Alert Transmitter on April 20, 2018.

4. MoU was signed between SAC and CEPT University-for Academic Research Collaboration on April 19, 2018.

5. MoU was signed between SAC and CII's Indian Green Building Council for collaborating with CII's Indian Green Building Council for green building registration, certification agency cum facilitator for the purpose of advisory and handholding for the upcoming building projects of SAC/ISRO on April 20, 2018.

6. 100th MoU was signed between SAC and Orissa Agriculture and Technology University for Technical support in R & D and Capacity Building on April 20, 2018.

100th MoU signing between SAC and Orissa Agriculture and Technology University University for Technical support in R & D and Capacity Building on April 20, 2018

TT Agreement with M/s. Kerala State Electronics Development Corporation Limited, Trivandrum for Distress Alert Transmitter on April 19, 2018.

SAC Participates in BSX-2018

ISRO in association with Confederation of Indian Industry (CII) and ANTRIX has organised the 6th edition of Bengaluru Space Expo - 2018 at Bengaluru International Exhibition Centre (BIEC), Bengaluru during 6–8th September, 2018. SAC participated in this exhibition with 32 employees from different disciplines. SAC depicted its own stall displaying hardware such as satellite mobile radio, reporting terminal, personnel tracker, broadcast receiver, origami lens, lander camera lens for Chandrayaan-2, optical butting module, NavIC receiver, C band and L band TR module etc.

Workshops, Seminars & Training Programmes

Refresher Course on 'Fundamental Concepts of Digital Image Processing for Interpretation of Remote Sensing Data' held at IIT-Kharagpur during April 16-26, 2018. 22 participants attended the programme.

Refresher Course on 'Special Topics on Antenna Theory and Practice' held at IIT-Kharagpur during May 07-19, 2018. 20 participants attended the programme.

Training Programme on Python was organized during August 23-29, 2018 at SAC. 25 participants attended the programme.

Programme on Machine Learning for Data Mining on July 16-20, 2018 at DA-IICT, Gandhinagar. 25 participants attended the programme.

Training on Programmable Logic Controller (PLC) and its applications was organized in association with Pandit Deendayal Petroleum University (PDPU), Gandhinagar at PDPU, Gandhinagar during August 28 to September 01, 2018 at SAC. 17 participants attended the programme.

Programme on First Aid Awareness (Batch-I) on September 19, 2018 for newly joined Technicians to create awareness about first aid aspects. 26 participants attended the Programme.

ISRO Induction Training Programme (IITP-30) was organized during April 16 to May 07, 2018. 132 participants from various Centers are attended the programme.

Lecture Series

Lecture on 'Saraswati in the Sky' by Prof. Joydeep Bagchi, Inter University Centre for Astronomy & Astrophysics (IUCAA), Pune on May 9, 2018.

Motivational Talk by Asian Para Cyclist Shri Aditya Mehta on June 7, 2018.

A lecture on 'Yoga for Health' by Dr. Chandrasinh Jhala, Vice Chancellor Lakulish Yoga University, Ahmedabad on June 15, 2018.

A lecture on 'Fourth wave of Management and Leadership' by Swami Nikhileswarananda, Head, Ramakrishna Mission, Rajkot on July 12, 2018.

Lecture by Shri S Hiriyanna, Group Head, GEOSAT PMSG/URSC on 'The Curious Truth Behind Everyday Numbers' on July 27, 2018.

Talk by Ms. Pannaben Momaya, Addi. DCP Women Cell, Ahmedabad on 'Safety Aspects of Women Working on Contract Basis' on May 18, 2018.

Educational Visits

Educational Visit of The Institute of Engineers (India) Udaipur Local Centre, Udaipur on April 25, 2018 at SAC. 19 professionals visited SAC Campus.

Educational visit of Institute of Plasma research (IPR), Gandhinagar on June 26, 2018 at SAC. 44 students visited SAC campus.

Educational visit of ITS officers from National Telecommunications Institute for Policy Research, Innovation & Training (NTIPRIT), Department of Telecommunication, Ghaziabad on August 09, 2018. 37 officers visited SAC campus.

Educational visit of M.Tech & Ph.D. Students from Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT), Gandhinagar on August 11, 2018. 80 students visited SAC Bopal campus.

SUPERANNUATION

The following colleagues superannuated from SAC during April-September 2018.
SAC appreciates their valuable services during their tenure at SAC

SAC Courier wishes them a happy, peaceful and healthy retired life
(Details indicate Name, Division and the Journey commencement date at SAC)

April 2018

Sri. Rajesh Naranbhai Garvalia
SEDA-SEG-SEPD
29-Sep-1980

Smt. Jaspalkaur G Bhatia
ESSA-EFMG-PFD
9-Oct-1978

Jun 2018

Sri. Javsinghbhai N Mahida
ADMIN-PURCHASE-STORES
21-Aug-1978

Sri. K J Kagdekar
ESSA-EFMG-PEFD
9-Oct-1978

August 2018

Smt. Nita Kirtikumar Sola
MRSA-MSTG-MSTD
28-Jul-1983

Sri. Bharat S Nandankar
ADMIN-CMG-CED
17-Jan-1984

Sri. Viru P. Shahdadpuri
ADMIN-P & GA-P & PR
12-May-1983

Smt. Shobhana R Vasava
DIR-OFF-LIBRARY
31-May-1985

Smt. Kalyani B Pandya
SEDA-EOSDIG-SSD
29-Jan-1992

May 2018

Sri. Dilipkumar C Jethva
ADMIN-CMG-ACMD
13-Dec-1977

Sri. Chhavinath Lal
ADMIN-P & GA-P & PR
11-Aug-1978

Sri. R S Gajjar
SRG-PMQD-M
4-Sep-1978

Sri. Babubhai P Buval
ESSA-EFMG-ESSD
23-Jan-1979

Sri. Chhaganbhai Ramanlal Patel
MESA-MAMG-AMDD
21-Mar-1984

Smt. Pushpa D. Nailani
SRG-SRG-QACD
4-Jul-1983

Sri. Motibhai Dalabhai Patel
ADMIN-CMG-CED
30-Jul-1984

July 2018

Sri. Bhagvandas M Bhil
SIPG-ODPD
23-Aug-1978

Smt. Neelu Jain
SNPA-IPCD
20-Jul-1983

Kum Varsha K Bhatt
SNPA-ODCG-DCD
16-Feb-1984

Smt. M M Makwana
SSAA-CAG
17-Feb-1984

Mrs. S C Bakariya
SNPA
12-Dec-1986

September 2018

Sri. Vikaskumar P Patel
PPG
14-Dec-1988

SAC observed National Fire Service week during April 10-14, 2018. Various activities like essay competition, slogan competition related to fire safety measures were conducted.

The International Day of Yoga was celebrated on June 21, 2018, preceded by a week-long Yoga workshop at SAC campus.

SAC celebrated 127th birth Anniversary of Bharat Ratna, Dr. B. R. Ambedkar on April 18, 2018. As a part of the celebration, a lecture on 'The role of Dr. B. R. Ambedkar in Nation Building' by Shri Udai Singh, Retd. General Manager, ONGC was conducted.

SAC Innovation Award function was organized on May 17, 2018. Director SAC handed over Awards and Appreciation Certificates for Technology Transfer and Patent (Granted) cases to the winners.

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